



## Features

- Surface mount packaging for automated assembly
- Small footprint size (1206) and low profile for space-constrained mobile applications
- Ultra-low resistance
- RoHS compliant\* and halogen free\*\*
- Agency recognition:

## Applications

- Thermal protection for Li-ion & polymer battery packs
- USB port protection - USB 2.0, 3.0 & OTG
- HDMI 1.4 Source protection
- PC motherboards - Plug & Play protection
- Mobile phones - Battery & port protection
- PDAs / digital cameras
- Game console port protection

## MF-NSML Series - Low Ohmic PTC Resettable Fuses

### Electrical Characteristics

| Model      | V max.<br>Volts | I max.<br>Amps | I <sub>hold</sub> | I <sub>trip</sub> | Resistance        |                    | Max. Time To Trip |                  | Tripped Power Dissipation |
|------------|-----------------|----------------|-------------------|-------------------|-------------------|--------------------|-------------------|------------------|---------------------------|
|            |                 |                | Amperes at 23 °C  |                   | Ohms at 23 °C     |                    | Amperes at 23 °C  | Seconds at 23 °C | Watts at 23 °C            |
|            |                 |                | Hold              | Trip              | R <sub>Min.</sub> | R <sub>1Max.</sub> |                   |                  | Typ.                      |
| MF-NSML150 | 6               | 50             | 1.50              | 3.00              | 0.0100            | 0.0650             | 8.00              | 0.50             | 0.8                       |
| MF-NSML175 | 6               | 50             | 1.75              | 3.50              | 0.0050            | 0.0400             | 8.00              | 0.50             | 0.8                       |
| MF-NSML190 | 6               | 50             | 1.90              | 4.90              | 0.0050            | 0.0300             | 8.00              | 1.00             | 0.8                       |
| MF-NSML200 | 6               | 50             | 2.00              | 4.00              | 0.0050            | 0.0300             | 8.00              | 1.00             | 0.8                       |
| MF-NSML260 | 6               | 50             | 2.60              | 5.20              | 0.0030            | 0.0260             | 8.00              | 4.00             | 0.8                       |
| MF-NSML300 | 6               | 50             | 3.00              | 6.00              | 0.0025            | 0.0200             | 8.00              | 4.00             | 0.8                       |
| MF-NSML350 | 6               | 50             | 3.50              | 7.00              | 0.0020            | 0.0180             | 8.00              | 5.00             | 0.8                       |
| MF-NSML380 | 6               | 50             | 3.80              | 8.00              | 0.0015            | 0.0140             | 8.00              | 5.00             | 0.8                       |
| MF-NSML400 | 6               | 50             | 4.00              | 8.00              | 0.0015            | 0.0140             | 8.00              | 5.00             | 0.8                       |
| MF-NSML450 | 6               | 50             | 4.50              | 9.00              | 0.0010            | 0.0140             | 22.5              | 2.00             | 0.8                       |
| MF-NSML500 | 6               | 50             | 5.00              | 10.0              | 0.0010            | 0.0120             | 25.0              | 2.00             | 0.8                       |
| MF-NSML550 | 6               | 50             | 5.50              | 11.0              | 0.0010            | 0.0110             | 27.5              | 2.00             | 0.8                       |
| MF-NSML600 | 6               | 50             | 6.00              | 12.0              | 0.0010            | 0.0100             | 30.0              | 2.00             | 0.8                       |

### Environmental Characteristics

|                                        |                                                                          |
|----------------------------------------|--------------------------------------------------------------------------|
| Operating Temperature.....             | -40 °C to +85 °C                                                         |
| Storage Condition                      |                                                                          |
| Before Opening .....                   | +40 °C max. / 70 % RH max.                                               |
| After Opening.....                     | +40 °C max. / 10 % RH max.                                               |
| Floor Condition After Opening .....    | Consumption within 4 weeks at floor condition +30 °C max. / 60 % RH max. |
| Passive Aging .....                    | +85 °C, 1000 hours..... ±10 % typical resistance change                  |
| Humidity Aging.....                    | +85 °C, 85 % R.H. 100 hours..... ±15 % typical resistance change         |
| Thermal Shock .....                    | +85 °C to -40 °C, 20 times..... ±30 % typical resistance change          |
| Solvent Resistance.....                | MIL-STD-202, Method 215..... No change                                   |
| Vibration .....                        | MIL-STD-883C, Method 2007.1..... No change                               |
|                                        | Condition A                                                              |
| Moisture Sensitivity Level (MSL) ..... | <a href="#">See Note</a>                                                 |
| ESD Classification - HBM.....          | Class 6                                                                  |

### Test Procedures And Requirements

| Test                 | Test Conditions                                       | Accept/Reject Criteria                   |
|----------------------|-------------------------------------------------------|------------------------------------------|
| Visual/Mech.....     | Verify dimensions and materials.....                  | Per MF physical description              |
| Resistance.....      | In still air @ 23 °C.....                             | R <sub>min</sub> ≤ R ≤ R <sub>1max</sub> |
| Time to Trip.....    | At specified current, V <sub>max</sub> , 23 °C.....   | T ≤ max. time to trip (seconds)          |
| Hold Current .....   | 30 min. at I <sub>hold</sub> .....                    | No trip                                  |
| Trip Cycle Life..... | V <sub>max</sub> , I <sub>max</sub> , 100 cycles..... | No arcing or burning                     |
| Trip Endurance ..... | V <sub>max</sub> , 48 hours.....                      | No arcing or burning                     |
| Solderability.....   | 245 °C ± 5 °C, 5 seconds .....                        | 95 % min. coverage                       |

cUL File Number..... E174545  
TÜV Certificate Number ..... [R 50302873](#)



**WARNING Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)**

\* RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.

\*\*Bourns considers a product to be "halogen free" if (a) the Bromine (Br) content is 900 ppm or less; (b) the Chlorine (Cl) content is 900 ppm or less; and (c) the total Bromine (Br) and Chlorine (Cl) content is 1500 ppm or less.

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Users should verify actual device performance in their specific applications.

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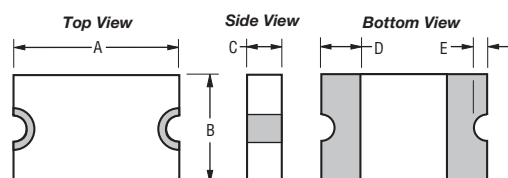
# MF-NSML Series - Low Ohmic PTC Resettable Fuses

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## Product Dimensions

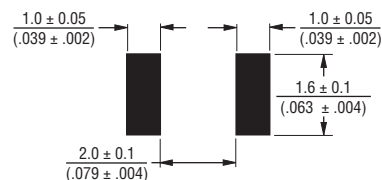
| Model      | A                      |                        | B                      |                        | C                      |                        | D                      | E                      |                        |
|------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
|            | Min.                   | Max.                   | Min.                   | Max.                   | Min.                   | Max.                   | Min.                   | Min.                   | Max.                   |
| MF-NSML150 | $\frac{3.00}{(0.118)}$ | $\frac{3.50}{(0.138)}$ | $\frac{1.40}{(0.055)}$ | $\frac{1.80}{(0.071)}$ | $\frac{0.30}{(0.012)}$ | $\frac{0.60}{(0.024)}$ | $\frac{0.25}{(0.010)}$ | $\frac{0.05}{(0.002)}$ | $\frac{0.45}{(0.018)}$ |
| MF-NSML175 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML190 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML200 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML260 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML300 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML350 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML380 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML400 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML450 | $\frac{3.00}{(0.118)}$ | $\frac{3.50}{(0.138)}$ | $\frac{1.40}{(0.055)}$ | $\frac{1.80}{(0.071)}$ | $\frac{0.60}{(0.024)}$ | $\frac{1.20}{(0.047)}$ | $\frac{0.25}{(0.010)}$ | $\frac{0.05}{(0.002)}$ | $\frac{0.45}{(0.018)}$ |
| MF-NSML500 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML550 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML600 |                        |                        |                        |                        |                        |                        |                        |                        |                        |

DIMENSIONS:  $\frac{\text{MM}}{(\text{INCHES})}$



Terminal material:  
ENIG-plated terminals

## Recommended Pad Layout



## Packaging Specifications

MF-NSML150~MF-NSML400 = 5000 pcs. per reel  
MF-NSML450~MF-NSML500 = 3500 pcs. per reel  
MF-NSML550~MF-NSML600 = 3000 pcs. per reel

## Thermal Derating Table - $I_{hold}$ (Amps)

| Model      | Ambient Operating Temperature |        |      |       |       |       |       |       |       |
|------------|-------------------------------|--------|------|-------|-------|-------|-------|-------|-------|
|            | -40 °C                        | -20 °C | 0 °C | 23 °C | 40 °C | 50 °C | 60 °C | 70 °C | 85 °C |
| MF-NSML150 | 2.20                          | 2.00   | 1.77 | 1.50  | 1.28  | 1.15  | 1.07  | 0.85  | 0.70  |
| MF-NSML175 | 2.57                          | 2.33   | 2.07 | 1.75  | 1.49  | 1.34  | 1.24  | 1.00  | 0.80  |
| MF-NSML190 | 2.80                          | 2.55   | 2.25 | 1.90  | 1.60  | 1.46  | 1.35  | 1.09  | 0.90  |
| MF-NSML200 | 2.94                          | 2.65   | 2.35 | 2.00  | 1.70  | 1.53  | 1.42  | 1.14  | 0.93  |
| MF-NSML260 | 3.82                          | 3.46   | 3.07 | 2.60  | 2.21  | 1.95  | 1.85  | 1.48  | 1.20  |
| MF-NSML300 | 4.41                          | 3.99   | 3.54 | 3.00  | 2.55  | 2.32  | 2.13  | 1.71  | 1.38  |
| MF-NSML350 | 5.15                          | 4.66   | 4.13 | 3.50  | 2.98  | 2.71  | 2.49  | 2.00  | 1.65  |
| MF-NSML380 | 5.59                          | 5.05   | 4.48 | 3.80  | 3.23  | 2.95  | 2.60  | 2.15  | 1.75  |
| MF-NSML400 | 5.80                          | 5.25   | 4.65 | 4.00  | 3.40  | 3.10  | 2.65  | 2.20  | 1.80  |
| MF-NSML450 | 6.10                          | 5.40   | 4.70 | 4.50  | 3.60  | 3.15  | 2.70  | 2.25  | 1.85  |
| MF-NSML500 | 6.80                          | 6.00   | 5.25 | 5.00  | 4.00  | 3.50  | 3.00  | 2.50  | 1.90  |
| MF-NSML550 | 7.50                          | 6.60   | 5.80 | 5.50  | 4.40  | 3.85  | 3.30  | 2.75  | 2.10  |
| MF-NSML600 | 8.15                          | 7.20   | 6.35 | 6.00  | 4.80  | 4.20  | 3.60  | 3.00  | 2.30  |

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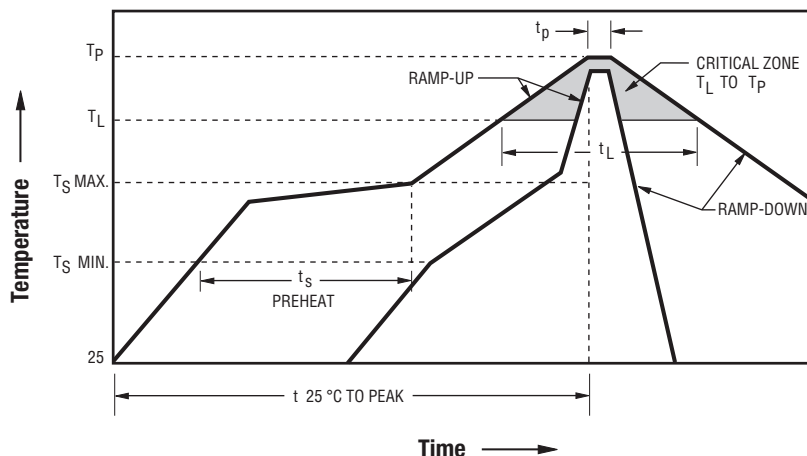
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# MF-NSML Series - Low Ohmic PTC Resettable Fuses

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## Solder Reflow Recommendations



### Notes:

- MF-NSML models cannot be wave soldered or hand soldered. Please contact Bourns for soldering recommendations.
- All temperatures refer to topside of the package, measured on the package body surface.
- If reflow temperatures exceed the recommended profile, devices may not meet the published specifications.
- Compatible with Pb and Pb-free solder reflow profiles.
- Excess solder may cause a short circuit, especially during hand soldering. Please refer to the Multifuse® Polymer PTC Soldering Recommendation guidelines.

| Profile Feature                                                                                                                   | Pb-Free Assembly                   |
|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Average Ramp-Up Rate ( $T_{S\max}$ to $T_P$ )                                                                                     | 3 °C / second max.                 |
| PREHEAT:<br>Temperature Min. ( $T_{S\min}$ )<br>Temperature Max. ( $T_{S\max}$ )<br>Time ( $T_{S\min}$ to $T_{S\max}$ ) ( $t_s$ ) | 150 °C<br>200 °C<br>60~180 seconds |
| TIME MAINTAINED ABOVE:<br>Temperature ( $T_L$ )<br>Time ( $t_L$ )                                                                 | 217 °C<br>60~150 seconds           |
| Peak Temperature ( $T_P$ )                                                                                                        | 260 °C                             |
| Time within 5 °C of Actual Peak Temperature ( $t_p$ )                                                                             | 20~40 seconds                      |
| Ramp-Down Rate                                                                                                                    | 6 °C / second max.                 |
| Time 25 °C to Peak Temperature                                                                                                    | 8 minutes max.                     |

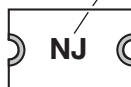
### How to Order

**MF - NSML 200 - 2**

Multifuse® Product Designator \_\_\_\_\_  
 Series \_\_\_\_\_  
 NSML = 1206 Low Ohmic Surface Mount Component  
 Hold Current,  $I_{hold}$  \_\_\_\_\_  
 150 - 600 (1.50 Amps - 6.00 Amps)  
 Packaging \_\_\_\_\_  
 Packaged per EIA 481  
 -2 = Tape and Reel

### Typical Part Marking

Represents total content. Layout may vary.



#### PART IDENTIFICATION:

MF-NSML150 = NG  
 MF-NSML175 = NH  
 MF-NSML190 = NI  
 MF-NSML200 = NJ  
 MF-NSML260 = NN  
 MF-NSML300 = NP  
 MF-NSML350 = NS  
 MF-NSML380 = NV  
 MF-NSML400 = NU  
 MF-NSML450 = NX  
 MF-NSML500 = NY  
 MF-NSML550 = N5  
 MF-NSML600 = NZ

MANUFACTURING DATE CODE IS LOCATED ON PACKING LABEL.

**BOURNS®**

### Asia-Pacific:

Tel: +886-2 2562-4117  
 Email: asiacus@bourns.com

### Europe:

Tel: +36 88 885 877  
 Email: eurocus@bourns.com

### The Americas:

Tel: +1-951 781-5500  
 Email: americus@bourns.com  
[www.bourns.com](http://www.bourns.com)

MF-NSML SERIES, REV. J, 02/19

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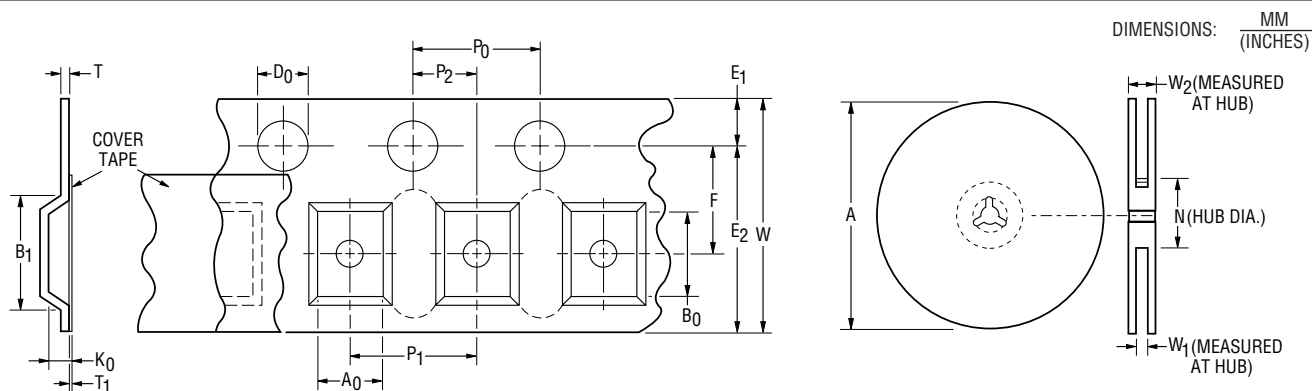
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# MF-NSML Series - Low Ohmic PTC Resettable Fuses

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| Tape Dimensions                        |  | MF-NSML Series<br>per EIA 481           |
|----------------------------------------|--|-----------------------------------------|
| W                                      |  | $12.0 \pm 0.30$<br>(0.472 $\pm$ 0.012)  |
| P <sub>0</sub>                         |  | $4.0 \pm 0.10$<br>(0.157 $\pm$ 0.004)   |
| P <sub>1</sub>                         |  | $4.0 \pm 0.10$<br>(0.157 $\pm$ 0.004)   |
| P <sub>2</sub>                         |  | $2.0 \pm 0.05$<br>(0.079 $\pm$ 0.002)   |
| A <sub>0</sub> (MF-NSML150~MF-NSML500) |  | $1.90 \pm 0.10$<br>(0.075 $\pm$ 0.004)  |
| A <sub>0</sub> (MF-NSML550~MF-NSML600) |  | $2.0 \pm 0.05$<br>(0.078 $\pm$ 0.002)   |
| B <sub>0</sub> (MF-NSML150~MF-NSML500) |  | $3.50 \pm 0.10$<br>(0.138 $\pm$ 0.004)  |
| B <sub>0</sub> (MF-NSML550~MF-NSML600) |  | $3.60 \pm 0.10$<br>(0.142 $\pm$ 0.004)  |
| B <sub>1</sub> max.                    |  | $4.5$<br>(0.177)                        |
| D <sub>0</sub>                         |  | $1.5 + 0.10/-0.0$<br>(0.059 + 0.004/-0) |
| F                                      |  | $5.5 \pm 0.05$<br>(0.216 + 0.002)       |
| E <sub>1</sub>                         |  | $1.75 \pm 0.10$<br>(0.069 $\pm$ 0.004)  |
| E <sub>2</sub> typ.                    |  | $10.25$<br>(0.404)                      |
| T max.                                 |  | $0.6$<br>(0.024)                        |
| T <sub>1</sub> max.                    |  | $0.1$<br>(0.004)                        |
| K <sub>0</sub> (MF-NSML150~MF-NSML400) |  | $0.65 \pm 0.10$<br>(0.026 $\pm$ 0.004)  |
| K <sub>0</sub> (MF-NSML450~MF-NSML500) |  | $1.10 \pm 0.10$<br>(0.043 $\pm$ 0.004)  |
| K <sub>0</sub> (MF-NSML550~MF-NSML600) |  | $1.35 \pm 0.10$<br>(0.053 $\pm$ 0.004)  |
| Leader min.                            |  | $390$<br>(15.35)                        |
| Trailer min.                           |  | $160$<br>(6.30)                         |
| Reel Dimensions                        |  |                                         |
| A max.                                 |  | $185$<br>(7.283)                        |
| N min.                                 |  | $50$<br>(1.97)                          |
| W <sub>1</sub>                         |  | $12.4 + 1/-0$<br>(0.488 + 0.039/-0)     |
| W <sub>2</sub> max.                    |  | $15.4$<br>(0.606)                       |



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**Application Notice**

- Users are responsible for independent and adequate evaluation of Bourns® Multifuse® Polymer PTC devices in the user's application, including the PPTC device characteristics stated in the applicable data sheet.
- Polymer PTC devices must not be allowed to operate beyond their stated maximum ratings. Operation in excess of such maximum ratings could result in damage to the PTC device and possibly lead to electrical arcing and/or fire. Circuits with inductance may generate a voltage above the rated voltage of the polymer PTC device and should be thoroughly evaluated within the user's application during the PTC selection and qualification process.
- Polymer PTC devices are intended to protect against adverse effects of temporary overcurrent or overtemperature conditions up to rated limits and are not intended to serve as protective devices where overcurrent or overvoltage conditions are expected to be repetitive or prolonged.
- In normal operation, polymer PTC devices experience thermal expansion under fault conditions. Thus, a polymer PTC device must be protected against mechanical stress, and must be given adequate clearance within the user's application to accommodate such thermal expansion. Rigid potting materials or fixed housings or coverings that do not provide adequate clearance should be thoroughly examined and tested by the user, as they may result in the malfunction of polymer PTC devices if the thermal expansion is inhibited.
- Exposure to lubricants, silicon-based oils, solvents, gels, electrolytes, acids, and other related or similar materials may adversely affect the performance of polymer PTC devices.
- Aggressive solvents may adversely affect the performance of polymer PTC devices. Conformal coating, encapsulating, potting, molding, and sealing materials may contain aggressive solvents including but not limited to xylene and toluene, which are known to cause adverse effects on the performance of polymer PTCs. Such aggressive solvents must be thoroughly cured or baked to ensure their complete removal from polymer PTCs to minimize the possible adverse effect on the device.
- Recommended storage conditions should be followed at all times. Such conditions can be found on the applicable data sheet and on the Multifuse® Polymer PTC Moisture/Reflow Sensitivity Classification (MSL) note:  
[https://www.bourns.com/docs/RoHS-MSL/msl\\_mf.pdf](https://www.bourns.com/docs/RoHS-MSL/msl_mf.pdf)

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